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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/927,894
Filing Date: August 10, 2001
Appellant(s): JEWETT ET AL.

Ronald J. Schoenbaum (Reg. No. 38,297)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed Oct. 5, 2006 appealing from the Office action mailed June 6, 2006

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Raid method and device with network protocol between controller and storage devices By Wang et al. U.S. Patent No. 6,834,326.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1 – 37 and 54 – 59 are rejected under 35 U.S.C. 102(e) as being anticipated by Wang et al. U.S. Patent No. 6,834,326. Wang teaches transparent access to a redundant array of devices, provides method and device for connecting redundant disk devices to a controller. (see abstract).

As to claim 1, Wang teaches a block-level shared network storage system, comprising:

a storage server comprising an array of disk drives, and comprising a processor that runs a device driver to provide block-level access to data stored on the array of disk drives (see col.5 line 64 – col. 6 line 10 and figs 6 and 8a Wang discloses an array of shared disks for data storing); and

a host computer coupled to the storage server by at least one computer network (see col.8 line 42 – 54 Wang discloses a controller or a host which is connected to multiple disks or storage devices); wherein the host computer and the storage server perform input/output (I/O) operations over the at least one network using multiple, concurrent logical connections, each logical connection being between the host computer and the storage server over the at least once computer network such that a first I/O operation is executed over a first logical connection while a second I/O operation is executed over a second logical connection (see col. 8 lines 42 – 54 and figs. 6 and 8a, Wang discloses multiple block of read/write operation to occur over multiple connections which provides logical connections using multicasting scheme).

As to claim 2, Wang teaches the network storage system as in Claim 1, wherein each logical connection is a socket connection (see col.26 lines 56 – 64).

As to claim 3, Wang teaches the network storage system as in Claim 2, wherein each socket connection is a TCP/IP socket connection (see fig. 7).

As to claim 4, Wang teaches the network storage system as in Claim 1, wherein each logical connection remains persistent over multiple I/O operations performed over that logical connection (see col.8 lines 42 – 54.).

As to claim 5, Wang teaches the network storage system as in Claim 1, wherein the host computer is programmed to divide an I/O operation into multiple constituent operations, and to perform the multiple constituent I/O operations in parallel over respective logical connections of said multiple, concurrent logical connections (see col.10 lines 66 –col. 11 lines 29, Wang discloses different file systems using different

hardware, for example database vendors implement different internal data structure " partitions" for storage devices).

As to claim 6, Wang teaches the network storage system as in Claim 1, wherein the storage server provides virtualized block-level storage access to the host computer such that the storage server is treated as local disk drive storage by user-level processes running on the host computer (see col. 5 lines 5 – 24, Wang discloses providing partitions of stripes 'virtualized block level storage' as storage devices).

As to claim 7, Wang teaches the network storage system as in Claim 1, wherein the storage server is configurable to provide multiple storage partitions, each of which may be allocated to a different host computer (see col. 5 lines 5 – 24, Wang discloses providing partitions of stripes 'virtualized block level storage' as storage devices).

As to claim 8, Wang teaches the network storage system as in Claim 1, wherein the storage server has a first storage partition which is uniquely assigned to the host computer such that the first storage partition appears to user-level processes running on the host computer as a private, local disk drive (see col. 15 lines 49 – 67).

As to claim 9, Wang teaches the network storage system as in Claim 8, wherein the storage server further has a second storage partition which is uniquely assigned to a second host computer (see fig. 6, Wang discloses a first host computer assigned to volume 1 and a second host computer assigned to volumes 2 - 4).

As to claim 10, Wang teaches the network storage system as in Claim 8, wherein the storage server further has a second storage partition which is shared by multiple host computers (see fig. 6).

As to claim 11, Wang teaches the network storage system as in Claim 1, wherein the host computer and the storage server implement an authentication protocol in which the storage server authenticates the host computer before allowing the host computer to perform input/output operations (see col. 10 lines 38 – 47).

As to claim 12, Wang teaches the network storage system as in Claim 1, wherein the host computer and the storage server implement a discovery protocol in which the storage server notifies the host computer of partitions assigned to the host computer (see col. 8 lines 65 – col. 9 line12).

As to claim 13, Wang teaches the network storage system as in Claim 1, wherein at least one of the logical connections is over a general-purpose computer network (see fig. 10).

As to claim 14, Wang teaches the network storage system as in Claim 1, wherein at least one of the logical connections is over an Ethernet network (see fig.12 item # 1210).

As to claim 15, Wang teaches the network storage system as in Claim 1, wherein the first and second logical connections exist over separate computer networks (see fig. 6).

As to claim 16, Wang teaches the network storage system as in Claim 1, wherein each logical connection exists between a respective reader/writer pair (see col. 9 lines 46 – 53).

As to claim 17, Wang teaches the network storage system as in Claim 1, wherein the host computer and the storage server are interconnected by at least one switch (see fig. 5).

As to claim 18, Wang teaches the network storage system as in Claim 1, wherein the host computer and the storage server each include two network interfaces that provide redundant network connections between the host computer and the storage server (see col. 10 line 66- col. 11 line10).

As to claim 19, Wang teaches a system for storing data for host computers, comprising:

a plurality of storage servers connected to a network, each storage server comprising an array of disk drives, an array controller, and a processor (see col.5 line 64 – col. 6 line 10 and fig. 4);

a plurality of host computers connected to the network and programmed to store data on the storage servers and at least one switch which interconnects the plurality of storage servers with the plurality of host computers wherein each host computer is programmed to open multiple concurrent sees socket connections over the network to the storage servers for performing concurrent input/output operations (see col. 8 lines 42 – 54 and fig. 6).

As to claim 20, Wang teaches the system of Claim 19, wherein the sockets socket connections are TCP/IP sockets connections (see fig. 7 Wang discloses network protocol includes transporting the IP packet using TCP).

As to claim 21, Wang teaches the system of Claim 19, wherein each storage server of the plurality of storage; servers provides virtualized block-level storage access to the host computers such that the Week storage servers appear are treated as local disk drive storage to by user-level processes running on the host computers (see claim 55).

As to claim 22, Wang teaches the system of Claim 19, wherein at least a first host computer of the plurality of host computers is programmed to divide an 1/O operation into multiple constituent 1/O operations, and to perform the multiple constituent 1/0 operations in parallel over respective logical socket connections between the first host computer and a target storage server (see col. 8 lines 42 – 54 and fig. 6).

As to claim 23, Wang teaches the system of Claim 19, wherein a first storage server of the plurality of storage servers is configurable to provide multiple, variable-size partitions, each of which may be allocated to a different host computer of the plurality of host computers (see col. 8 lines 56 – 63 and fig. 6).

As to claim 24, Wang teaches the system of Claim 19, wherein a first storage server of the plurality of storage servers has a first partition which is uniquely assigned to a first host computer of the plurality of host computers such that the first partition appears as a local disk drive to the first host computer (see col. 8 lines 56 – 63 and fig. 6).

As to claim 25, Wang teaches the system of Claim 24, wherein the first storage server further has a second partition which is uniquely assigned to a second host computer of the plurality of host computers (see col. 8 lines 56 – 63 and fig. 6).

As to claim 26, Wang teaches the system of Claim 19, wherein the host computers and the storage servers implement: an authentication protocol in which a storage server authenticates a host computer before allowing the host computer to perform input/output operations (see col. 10 lines 32 – 47).

As to claim 27, Wang teaches the system of Claim 19, wherein the host computers and the storage servers implement a discovery protocol in which a storage server notifies a host computer of partitions assigned to the host computer (see col. 8 lines 65 – col. 9 line12).

As to claim 28, Wang teaches a method of performing input/output operations, comprising: establishing first and second TCP/IP connections between a host computer and a block-level storage server over one or more computer networks (see claim 8 and fig. 7);

performing a first input/output operation over the first TCP/IP connection while concurrently with performing a second input/output operation over the second TCP/IP connection, each of said input/output operations comprising a transfer of input/output data between the host computer and the storage server; and maintaining the first and second TCP/IP connections is a persistent state such that each TCP/IP connection may be used to perform additional input/output operations (see col.8 lines 42 – 54).

As to claim 29, Wang teaches the method as in Claim 28, wherein the first and second TCP/IP connections are established over separate computer networks (see col.8 lines 42 – 54).

As to claim 30, Wang teaches the method as in Claim 28, wherein the first input/output operation is a first 1/O request issued from a first application running on the host computer, and the second input/output operation is a second 1/O request issued from a second application running on the host computer (see col. 9 lines 13 - 43).

As to claim 31, Wang teaches the method as in Claim 28, wherein the first and second input/output operations are constituent operations of an I/O request issued by a process running on the host computer, whereby the 1/O request is executed in parallel over multiple TCP/IP connections (see col. 8 lines 42 – 54 and fig. 6).

As to claim 32, Wang teaches the method as in Claim 28, further comprising establishing a third TCP/IP connection between the host computer and the storage server, and using the third TCP/IP connection to perform an authentication sequence in which the storage server authenticates the host computer (see col. 10 lines 33 – 47).

As to claim 33, Wang teaches the method as in Claim 32, further comprising conveying access information over the third TCP/IP connection from the storage server to the host computer, said access information specifying access rights uniquely assigned to the host computer (see col. 10 lines 33 – 47).

As to claim 34, Wang teaches a method of executing an input/output (1/O) request received from a user-level process running on a host computer, comprising:

on the host computer, dividing the 1/O request into multiple constituent I/O operations (see col.8 lines 42 – 54); and

performing the multiple constituent T/O operations in parallel over multiple, respective logical network connections between the host computer and a target storage server such that I/O data is transferred between the host computer and the storage server over each of the logical network connections (see col. lines 42 – 54).

As to claim 35, Wang teaches the method of Claim 34, wherein each logical network connection is a socket connection (see col. (see col. 22 line 31 – 38 and fig.11).

As to claim 36, Wang teaches the method of Claim 34, wherein each logical network connection is a TCP/IP socket connection (see fig. 7).

As to claim 37, Wang teaches the method of Claim 34, wherein at least one of the logical network connections is over a general-purpose computer network (see fig. 10).

As to claim 54, Wang teaches the network storage system as in claim 1, wherein the host computer and the storage server communicate with each other over each of the logical connections using a TCP/IP protocol (see col. 8 lines 42 – 54 and fig. 6).
As to claim 55, Wang teaches the system of Claim 19, wherein a first host computer of said plurality of host computers is programmed to open first and second socket connections over the network to a first storage server of said plurality of storage servers, and to perform a first input/output operation over the first socket connection while performing a second input/output operation over the second socket connection (see col. 8 lines 42 – 54 and fig. 6).

As to claim 56, Wang teaches the system of Claim 19, wherein the host computers and storage servers are programmed to perform said input/output operations via TCP/IP communications over said socket connections (see col. 22 line 31 – 38 and fig.11).

As to claim 57, Wang teaches a computer program represented in computer storage, said computer program comprising executable instructions for performing the method of Claim 28 (see claim 8 and fig. 7);

As to claim 58, Wang teaches the method of Claim 34, wherein performing the multiple constituent I/O operations comprises the host computer communicating with the target storage server over the multiple logical network connections using a TCP/IP protocol (see col. 8 lines 42 – 54 and figs. 7 and 8a).

As to claim 59, Wang teaches a computer program represented in computer storage, said computer program comprising executable instructions for performing the method of Claim 34 (see col.8 lines 42 – 54).

(10) Response to Argument

The examiner summarizes the various points raised by appellant and addresses replies individually.

As per appellant Wang does not disclose the host computer is programmed to divide the I/O operation into multiple constituents I/O operations, and to perform the

multiple constituents I As per appellants arguments filed on Oct. 5, 2006, the appellant argues that Wang does not teach or suggest perform input/output (I/O) operation over the at least one network using multiple, concurrent logical connections such that a first input/output (I/O) operation is executed over a first logical connection while a second I/O operation is executed over a second logical connection (see brief pages 6,7,8,11 ands 12 argument A).

In response to A), Wang teaches the control of multicast implosion for a large quantity of data, delay and back off algorithms minimize oscillation. Wang teaches a switch in communication with multiple storage devices over raw Ethernet, IP over UDP and TCP, fibre channel, or other protocols. This implementation is shown in fig. 6 and fig 8a. Wang clearly discloses that multiple logical connections are established between the host (controller) and multiple disk drives via multicasting scheme (see col. 11, lines 50 – col. 12).

As per appellant Wang does not disclose the host computer is programmed to divide the I/O operation into multiple constituents I/O operations, and to perform the multiple constituents I/O operations in parallel over respective logical connections of said multiple, concurrent logical connections (see brief pages 7, 9 and 10 argument B).

In response to B), Wang discloses a host or a CPU that sends a command using a SCSI bus, which allows the conducting of multiple block logical read/write operation in parallel. Moreover, Wang discloses the implementation of RAID stripes over SCSI

where multiple commands are sent to multiple devices to read or write data (see col. 4 lines 40 – 61 and col. 6 lines 44).

As per appellant Wang does not disclose or suggest the allocation of different storage partitions provided by storage server to different host Computers (see brief pages 8, 9 and 10 argument C).

In response to C), Wang discloses different types of file systems using different hardware, for instance data base vendors implement their own internal data structure (partitions) for various storage devices, therefore Wang discloses the allocation of different storage partitions (see col. 10 line 66 – col. 11 line 29).

As per appellant Wang does not disclose the host computer and the storage server each include two network interfaces that provide redundant network connections between the host computer and the storage server (see brief page 8 argument D).

In response to D), Wang discloses a method to increase the transmission of data between a switch (host) and storage devices by adding a second or third network interface controller (NIC), also known as NIC card, to a switch or host (see col. 33 lines 24 – 38).

As per appellant Wang does not disclose performing input/output operations in parallel over multiple concurrent socket connections over a Network (see brief pages 9, 10 argument E).

In response to E), Wang discloses a parallelism of data transfer between a host and NETSCSI disks utilizing user data protocol (UDP). The user data protocol uses the destination IP address and port number to send out packets by calling the socket send message (see col. 25 lines 14 – 20).

As per appellant Wang does not disclose establishing first and disclose TCP/IP connection between the host computer and the storage Devices (see brief pages 10 and 11, argument F).

In response to F, Wang discloses Wang teaches the control of multicast implosion for a large quantity of data, delay and back off algorithms minimize oscillation. Wang teaches a switch in communication with multiple storage devices over raw Ethernet, IP over UDP and TCP, fibre channel, or other protocols (see col. 10 line 66 - col. 11 line 29 and fig. 7).

As per footnote on page 7 of the appeal brief, applicants' representative claims that during a telephone interview that was conducted on April 25, 2006 (see brief page 7 foot note, argument G). Applicants' representative asked the examiner how the

limitation of claim 5 was interpreted by the examiner (see brief page 7 foot note, argument G).

Examiner pointed to Applicants' representative to figs. 6 and 8a to point out the multiple I/O operation conducted and to col.6 lines 22 – 32 to show the logical connections that occur in parallel. Applicants' representative inadvertently did not include some of the explanations and interpretations of Wang reference that were provided by the examiner during the phone interview.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Sargon Nano
S.N.
Dec. 20, 2006

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